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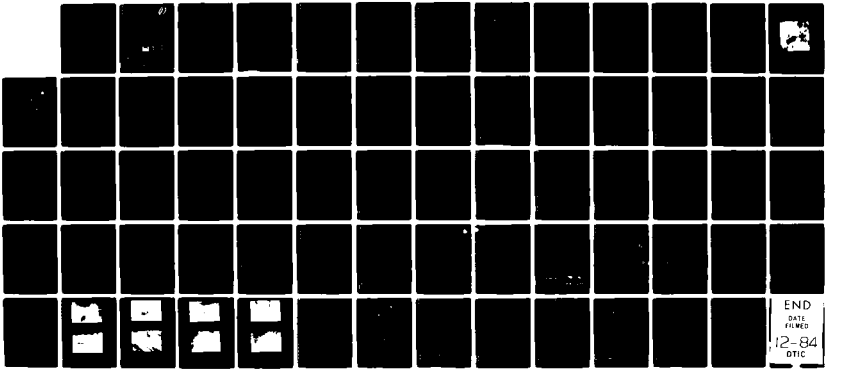

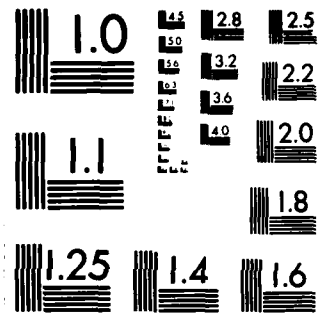

TAUNTON RIVER BASIN
FOXBOROUGH, MASSACHUSETTS

LAKE MIRIMICHI DAM
MA 00168

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

APRIL 1979

UNCLASSIFIED

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Foxborough, Mass.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Lake Mirimichi Dam is a 620 foot long, 14 foot high earthfill dam including an ogee spillway. The dam is in fair condition. The dam has been classified as "small" and in the "significant" hazard category. A test flood equal to ½ the PMF was used for this analysis.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

AUG 29 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

I am forwarding to you a copy of the Lake Mirimichi Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, City of Attleboro, Department of Public Works, 1294 West Street, Attleboro, Massachusetts 02703.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

LAKE MIRIMICHI DAM

MA 00168

TAUNTON RIVER BASIN
FOXBOROUGH, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00168

Name of Dam: Lake Mirimichi

Town: Foxborough

County and State: Norfolk County, Massachusetts

Stream: Wading River - Tributary of the Taunton River

Date of Inspection: December 5 and 6, 1978

Lake Mirimichi Dam is a 620-foot long, 14-foot high earthfill dam including a ogee spillway. The existing dam was constructed prior to 1925 with major modifications performed in 1925 and 1926. These modifications included a new spillway and outlet structure and outlet pipe. The 36.5-foot long, concrete spillway essentially bisects the dam. The spillway has a crest at elevation (El) 158.5. A one-story cabin is located on the embankment near the left abutment. The outlet conduit is a 24-inch pipe located between the spillway and the right abutment of the dam. Flow through the conduit is controlled by two slide gates housed in a concrete chamber located in the embankment. A 7-foot high, 800-foot long dike is located about 50 feet south of the dam. There are several houses and garages along both sides of the crest of the dike, which is paved with asphalt and known as Taylor Road.

The dam is in fair condition. There are deficiencies which must be corrected to assure the continued performance of this dam. This conclusion is based upon the visual inspection at the site, the limited engineering data, and little evidence of operating and maintenance procedures.

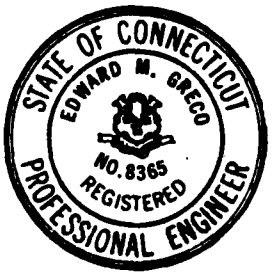
LAKE MIRIMICHI DAM

The following are visible signs of distress: seepage just beyond the downstream toe of the dam and dike, growth of brush and trees on the dam and dike, erosion at several locations on the embankment, lack of adequate riprap protection on the upstream face of the dam and dike, corrosion of stems on the slide gates and spalled and cracked concrete on the weir and training walls of the spillway.

Based on the Corps of Engineer's guidelines, the dam has been classified as "small" and in the "significant" hazard category. Accordingly, a test flood equal to one-half the probable maximum flood (PMF) was used for this analysis. Hydraulic analyses indicate that the spillway at the dam can discharge a flow of 700 cubic feet per second (cfs) at El 161.3, which is the average low elevation on the crest of the dike. The test flood (one-half the PMF) produces an outflow of 4,000 cfs with the lake at El 163.5. The test flood would overtop the dike by about 2.2 feet, the dam by 0.8 foot, and a swale at the south end of the lake by 1.3 feet. The spillway can discharge only 17.5 percent of the test flood before the dike is overtopped. In the event of overtopping, complete failure of the dam could occur.

It is recommended that the Owner employ the services of a qualified consultant to evaluate the stability of the dam and dike and evaluate the seepage at the toe of the dam and dike; to conduct a more detailed hydrologic and hydraulic investigation, design riprap for the upstream face of the dam, dike, and downstream end of the outlet pipe; and to evaluate the condition of the slide gates and concrete chamber. It is also recommended that the Owner accomplish the following: remove selected trees, brush and debris from the slopes and downstream toe of the dam and dike; repair spalled and cracked concrete on the weir and training walls of the spillway; and maintain the slide gates in working condition. The Owner should also implement a systematic program of inspection and maintenance.

The recommendations and remedial measures outlined above and in Section 7 should be implemented by the Owner within a period of one year after receipt of this Phase I Inspection Report.



Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.

Connecticut Registration
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Approved by:

Stephen L. Bishop, P.E.
Vice President
Metcalf & Eddy, Inc.

Massachusetts Registration
No. 19703

This Phase I Inspection Report on Lake Mirimichi Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
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Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

LAKE MIRIMICHI DAM

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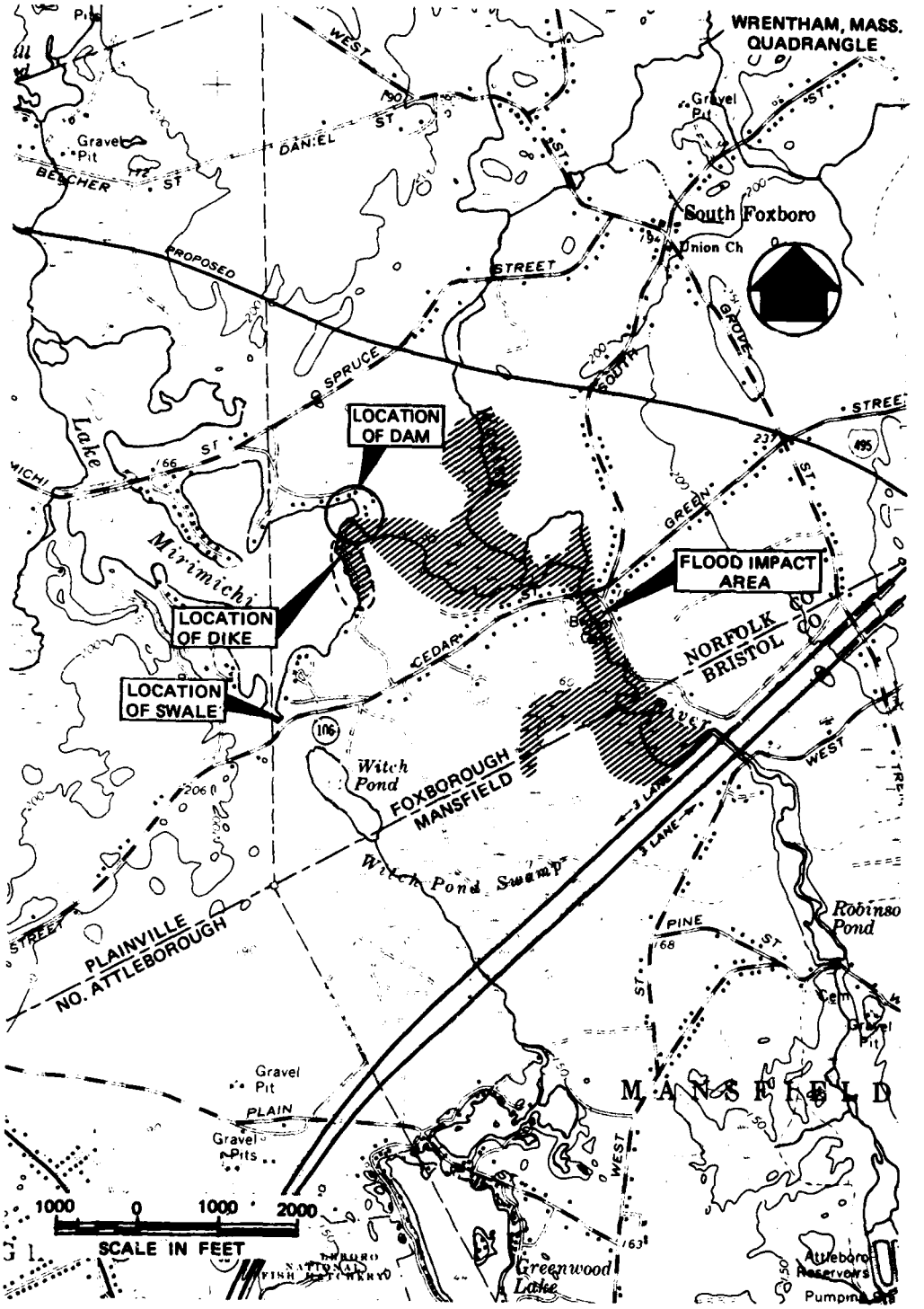
OVERVIEW
LAKE MIRIMICHI DAM
FOXBOROUGH, MASSACHUSETTS



LOCATION MAP – LAKE MIRIMICHI DAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

LAKE MIRIMICH DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Divison of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-79-C-0016, dated November 28, 1978, has been assigned by the Corps of Engineers for this work.

b. Purpose:

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. The dam is located on an unnamed brook which drains into Wading River, a tributary of Threemile River, in the Town of

Foxborough, Norfolk County, Massachusetts (see Location Map).

b. Description of Dam and Appurtenances. Lake Mirimichi Dam is an earthfill dam with a maximum height of 14 feet (see Plan of Dam and Sections, Figures B-1 through B-4). The dam and spillway are about 620 feet long, and the spillway is 36.5 feet long. The dam is separated by the spillway into two embankment sections, referred to as the left (north) embankment and the right (south) embankment. In plan, the right embankment is curved backward into the reservoir. The left embankment makes an abrupt 90 degree angle from the spillway. A one-story cabin is located on the left embankment close to the left abutment. The crest of the dam is 11 to 16 feet wide and is covered with grass and a foot path. The crest varies from El 162.6 to El 164.7, except next to both spillway training walls where it is at El 161.0. The upstream slope varies from 3.1:1 to 2.2:1 (horizontal:vertical), and the downstream slope varies from 4.7:1 to 2.3:1. Both slopes are covered with brush, grass and trees. There is very little riprap on the upstream slope and it is distributed erratically, such as adjacent to the upstream ends of the training walls of the spillway. There is a large pool of relatively clear water at or near the downstream toe of the dam along the right embankment. At the toe of the left embankment of the dam there are two separate seepage areas.

The concrete spillway consists of two vertical training walls and a 36.5-foot long ogee weir. The crest of the spillway is at El 158.5. A wooden walkway with a steel superstructure over the spillway is supported by square steel bars mounted on the crest. The sidewalls of the spillway are 2.5 feet above the crest and extend downstream to form the sides of a concrete stilling basin at the toe of the weir. The downstream end of the stilling basin is 32.0 feet long (training wall to training wall). The distance from the upstream edge of the weir to

the downstream end of the concrete stilling basin is 30 feet. According to drawings (see Figure B-3), there are two concrete core walls beneath the upstream and downstream ends of the spillway. The core walls extend to depths of 6.5 feet and 3.0 feet, respectively, below the bottom of the spillway slab. At each concrete core wall, two lines of sheeting were driven below the bottom of the core wall to serve as a cutoff. This sheeting extends beyond the training walls and into the embankment. Backfill next to the spillway walls is compacted, impervious soil. The bottom of the stilling basin is covered with stones. The spillway discharges into a natural streambed that widens out along the downstream toe of the embankment to the right of the spillway.

The outlet for the dam is a 24-inch diameter pipe located near the right abutment of the dam (see Figure B-1). A drawing dated 1925 (see Figure B-4) shows that the outlet extends from the upstream toe of the dam to just beyond the downstream toe. The upstream end of the outlet is shown on the drawing as constructed with a concrete headwall and a cutoff of sheeting. A concrete slide gate chamber extends beneath the crest of the dam. The top of the chamber is generally flush with the crest and contains two locked steel covers for access. Inside the chamber are two slide gates, one on the outlet (gate A) and one (gate B) on a 12-inch diameter apparent bypass which appears to circumvent the main slide gate A (see Figure B-4). The purpose of the bypass is unknown. Gate A is operated by rotating the stem with a wrench. Gate B is inoperable. The slide gates are submerged beneath 6.9 feet of water, with water surface at El 157.7 during inspection. Two gate stems extend above the submerged interior of the chamber to a small metal frame tied into the top of the chamber. According to the 1925 drawings, a concrete core wall extends 6 feet below the bottom of the slide gate chamber and laterally 7 feet beyond the walls. In addition, two lines of sheeting were driven below the bottom of the core wall to serve as a cutoff. This sheeting extends laterally beyond the core wall and into the embankment. Backfill

next to the core wall is impervious soil. The downstream end of the outlet pipe is shown on the 1925 drawing as constructed with a concrete headwall and a cutoff of timber sheeting, similar to the upstream end. Some of the wood sheeting is still visible around the downstream headwall. The invert of the outlet pipe is at El 149.8. The channel below the outlet is a natural streambed that widens and merges with the spillway channel downstream of the embankment.

A dike is located about 50 feet south of the right embankment. The dike is about 800 feet long and has a maximum height of 7 feet. The dike appears to be an earthfill embankment. The crest is about 15 feet wide and varies from El 161.0 to 163.5. The crest is paved with asphalt and known as Taylor Road. The upstream and downstream slopes are at about 2:1. Riprap is scattered on the upstream face of the dike.

At the south end of Lake Mirimichi and approximately 2,700 feet southwest of the dam, there is a low swale immediately north of Cedar Street (State Route 106). For a distance of about 100 feet, the ground surface varies from El 162.2 to El 162.5. Directly below this swale is an unpaved access road and a ditch along Cedar Street which drains into a culvert underneath Cedar Street. A swamp and Witch Pond are located south of Cedar Street.

c. Size Classification. Lake Mirimichi Dam is classified in the "small" category since it has a maximum height of 14 feet and a maximum storage capacity of 850 acre-feet.

d. Hazard Classification. Downstream of the dam is a wide, undeveloped, swampy flood plain. Discharge from the dam flows through the flood plain and merges with Wading River about 2,300 feet downstream, close to Cedar Street. After passing under a bridge on Cedar Street, Wading River meanders through another swamp with a lightly developed residential area east of the river and then flows under two bridges at Interstate Highway 95. The two bridges span embankments about 10 feet high. About four homes are located along the north side

of Cedar Street and immediately south along Wading River. In the event of complete failure of the dam, a flood wave 4 feet high at Cedar Street would result. This could cause appreciable damage to property, including flooding of at least the basements of about four homes north and south of Cedar Street, and the possible loss of a few lives. Furthermore, complete failure of the dam would cause appreciable economic loss since the reservoir is part of the water supply system to the City of Attleboro. Accordingly, the dam has been classified in the "significant" hazard category.

e. Ownership. The dam is located on property owned by the City of Attleboro, Department of Public Works, 1294 West Street, Attleboro, Massachusetts 02703. Mr. Burdon H. Blanchard, Chief Operator, Department of Public Works (617- 222-0019) granted permission to enter the property and inspect the dam and dike. Prior to 1927, the dam was owned by Mount Hope Finishing Company. The dike is located on property owned by people with houses on abutting lots.

f. Operators. The only known operators of this dam are personnel from the City of Attleboro, Department of Public Works.

g. Purpose of Dam. Lake Mirimichi is part of the water supply system for the City of Attleboro. Water is released into the Wading River and flows downstream through Robinson Pond and into Blakes Pond. At Blakes Pond, water can be diverted through a 48-inch pipeline into two water treatment filter beds. Water is pumped through wells from the filter beds, then through a pumping station and into a city water main. Lake Mirimichi is also used for recreational purposes.

h. Design and Construction History. There are no drawings available that show the construction of the dam prior to 1925 and 1926. A set of two drawings prepared by J.J. Van Valkenburgh and dated September 1925 are on file at the Norfolk County Engineer's office. Construction

pictures and notes are available at the Department of Public Works Office, City of Attleboro. The construction in 1926 consisted of (1) placing an outlet works structure where a spillway had apparently been situated, and (2) placing a concrete spillway where a second spillway had apparently been located. Inspection reports dated 1967, 1968, 1974 and 1978 are also available.

The 1967 inspection report indicates the dam was in excellent condition, although some trees and brush were on the crest of the dam. Percolation of water and small amounts of brown silt were reported in 1968 near the downstream end of the left wall of the spillway and near the downstream toe about 70 feet north of the outlet pipe. Possible seepage downstream was reported in 1978, including a swampy area near the outlet. Trees and brush on the dam have been reported from 1967 through 1978. Cracks in the spillway and training walls were noted in January 1978.

It was reported by the Owner that minor overtopping occurred during a storm in 1955. No damage was incurred to the structure, or at least no subsequent repair work was done.

1. Normal Operating Procedure. Under normal conditions, both slide gates on the outlet pipe are closed. Slide gate A is opened whenever it becomes necessary to supplement the flow in Wading River. This usually occurs in July. Whenever the outlet is opened, the Owner must report it to the Massachusetts Department of Environmental Quality Engineering (DEQE). Slide gate B on the bypass has not been opened by the Owner.

   The spillway is ungated and has no flashboards.

1.3 Pertinent Data

a. Drainage Area. The drainage area for Lake Mirimichi is estimated to be 7,405 acres (11.57 square miles). Two separate unnamed brooks flow into Lake Mirimichi, one from the north and one from Turnpike Lake to the west. Most of the drainage area is sparsely developed woodland and swamp. Portions of Wrentham State

Forest and Foxboro State Forest are in the drainage area. Residential development occurs along state highways and connector streets, especially in the north near downtown Wrentham. Some houses are also located around the lake. The embankment of Mirimichi Street crosses the lake and separates the northern one-third of the impoundment from the remainder of the lake.

b. Discharge. Uncontrolled discharge at the dam flows over a 36.5-foot long, concrete, ogee weir with the crest at El 158.5. A flat-bottomed, concrete stilling basin extends from the toe of the weir 22.2 feet downstream. The stilling basin is 32.0 feet long (side to side) at the downstream end, and the bottom is covered with stones. Discharge flows from the stilling basin into a natural streambed which meanders through a wide, swampy flood plain. The bottom of the streambed is covered with stones immediately downstream of the stilling basin. The stream merges with the Wading River about 2,300 feet downstream of the dam, close to Cedar Street. The river flows underneath a bridge on Cedar Street through an opening 16 feet wide and 7.3 feet high. Wading River meanders further downstream and under bridges at Interstate Highway 95.

The spillway can discharge an estimated 700 cfs with the water surface at El 161.3, which is the average elevation of the north end of the dike. An inflow test flood of 4,600 cfs (one-half the probable maximum flood) adjusted for surcharge storage results in a maximum discharge of 4,000 cfs. The spillway can discharge 17.5 percent of the test flood outflow before the dike is overtopped. The test flood outflow will overtop the main dam by 0.8 foot, the dike by 2.2 feet, and a swale at the south end of the pond by 1.3 feet. It was reported that the dam was slightly overtopped in 1955.

c. Elevation (feet above Mean Sea Level (MSL)). A benchmark was provided by the Owner at El 161.07 at the top of the left training wall of the spillway. This elevation is 2.07 feet higher than El 159.0 shown on the 1925 drawings (see Figures B-3 and B-4).

(1) Top dam - Main dam: 161.0 to 164.7
- Dike section: 161.0 to 163.5

(2) Test flood pool: 163.5

(3) Design surcharge: Unknown

(4) Full flood control pool: Not Applicable N/A

(5) Recreation pool: 158.5

(6) Spillway crest (ungated): 158.5

(7) Upstream portal invert diversion tunnel: N/A

(8) Streambed at centerline of dam: 150.0

(9) Maximum tailwater: 152.7

d. Reservoir

(1) Length of maximum pool: 5,900 feet

(2) Length of recreation pool: 5,900 feet

(3) Length of flood control pool: N/A

e. Storage (acre-feet)

(1) Test flood surcharge (net): 770 at El 163.5

(2) Top of dam (El 161.0): 850

(3) Flood control pool: N/A

(4) Recreation pool (El 158.5): 460

(5) Spillway crest (El 158.5): 460

f. Reservoir Surface (acres)

*(1) Top dam: 154

*(2) Test flood pool: 154

(3) Flood control pool: N/A

(4) Recreation pool: 154

(5) Spillway crest: 154

g. Dam

(1) Type - main dam: earthfill
- dike: earthfill

(2) Length - main dam: 620 feet
- dike: 800 feet

(3) Height - main dam: 14 feet
- dike: 7 feet

(4) Top width - main dam: varies from 11 to 16 feet
- dike: 15 feet

(5) Side slopes - main dam: upstream - 3.1:1 to 2.2:1; downstream - 4.7:1 to 2.3:1
- dike: upstream and downstream - 2:1

(6) Zoning: Unknown

(7) Impervious Core: N/A

(8) Cutoff: Timber sheeting and concrete core wall adjacent to and underneath spillway and slide gate chamber

(9) Grout curtain: Unknown

*Based on the assumption that the surface area will not increase significantly with changes in reservoir elevation from 158.5 to 163.5.

h. Spillway

(1) Type: Concrete, ogee weir

(2) Length of weir: 36.5 feet

(3) Crest elevation: 158.5

(4) Gates: None

(5) Upstream channel: Floor of approach channel is submerged, no visible obstructions. Sides are vertical, concrete wing walls with some riprap at upstream end.

(6) Downstream channel: Flat-bottomed, concrete stilling basin covered with stones, discharges into natural streambed. Vertical concrete training walls along stilling basin.

i. Regulating Outlet. The only regulating outlet at this dam is a 24-inch diameter pipe located near the right abutment of the dam. The pipe is about 77 feet long from toe to toe. Flow is controlled by one of two slide gates located beneath the crest of the dam in the slide gate chamber. The downstream invert of the outlet pipe is at El 149.8, and the invert of the slide gate chamber is at El 150.8. The outlet pipe terminates at a concrete headwall which discharges into a submerged streambed. The outlet has a capacity of 49 cfs (4.2 cfs per square mile) with the pond water surface at El 161.3.

SECTION 2

ENGINEERING DATA

2.1 General. There are two sheets of drawings dated September 1925 available from the Norfolk County Engineer's Office. No other plans, specifications or computations are available from the Owner, State or County relative to the design or construction of the dam. Visual observations during inspection, review of previous inspection reports, and conversations with the Owner and with personnel from Town, State and County agencies provided the remainder of the data for this evaluation.

We acknowledge the assistance and cooperation of personnel of the Massachusetts Department of Public Works and of the Massachusetts Department of Environmental Quality Engineering, Division of Waterways. Also, we acknowledge the cooperation and assistance of personnel from the Norfolk County Engineer's Office.

Mr. Burdon Blanchard, Chief Operator, Department of Public Works for the City of Attleboro, granted permission to enter the property and inspect the dam.

2.2 Construction Records. There are no as-built drawings available for this dam, only the proposed construction drawings. Pictures taken during construction in 1926 are on file with the City of Attleboro, Department of Public Works.

2.3 Operating Records. No operating records are available for the dam, and no daily record is kept of the elevation of the pool or rainfall at the site of the dam. A USGS gaging station is located about 15,000 feet downstream from the dam on the Wading River.

2.4 Evaluation

a. Availability. Due to the age of this dam, there is limited engineering data available.

b. Adequacy. The lack of detailed hydraulic, structural, and construction data did not allow for a definitive review. Therefore, the evaluation of the adequacy of this dam is based on review of available drawings, visual inspection, past performance history and engineering judgment.

c. Validity. Comparison of the available drawings with the field survey conducted during the Phase I inspection indicates that the available information is valid.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase I Inspection of the dam at Lake Mirimichi was performed on December 5 and 6, 1978. A copy of the inspection checklist is included in Appendix A. Inspection reports since 1967 were reviewed at the Norfolk County Engineer's Office and the Massachusetts Department of Public Works District No. 6 Office in Taunton.

b. Dam. The dam is a 620-foot long, 14-foot high earthfill embankment. In general, the dam is in fair condition. There is a large pool of relatively clear water at or near the downstream toe of the dam along most of the embankment south of the spillway. This is a low area inundated by discharge from the spillway and outlet pipe. The elevation of the pool is at El 152.7. At the toe of the embankment north of the spillway there are two distinct seepage areas. The first area is about 50 feet northeast of the spillway, and the surface of the clear standing water is at El 154.5. The second seepage area is located about 70 feet south of the cabin and although there is no standing water, this area is wet, soft, and covered with trash and debris.

The slopes of the dam are covered with a growth of grass, brush and trees. A wide, barren footpath is located on the crest of the dam. Considerable erosion has occurred on another footpath on the downstream slope of the dam about 10 feet right of the spillway. The downstream slope is also eroded next to the left training wall of the spillway. There is no riprap protection on the upstream slope except for a few scattered stones. Some stone has also been placed at the upstream ends of the spillway training walls. There are timber utility poles on the crest of the dam. A one-story cabin is located on the crest near the left abutment. The concrete foundation of the

porch in front of the cabin was built on the upstream slope of the dam. A low timber wall extends from the porch on the north shoreline and a low concrete wall from the porch on the south shoreline.

The earth dike is 800 feet long, 7 feet high and begins about 50 feet south of the main dam. In general, the dike is in fair condition. The crest of the dike is paved with asphalt and provides access to several houses located on both sides of Taylor Road. The upstream and downstream slopes of the dike are generally covered with brush and trees. There is seepage along most of the downstream toe of the dike. The surface of the water seeps varies from El 157.1 at the southern end of the dike to El 156.6 near the middle, to El 155.9 at the northern end. Some of the seepage water is flowing northward in a ditch along the toe of the dike. The seepage water eventually flows into the swamp downstream of the main dam. There is no riprap protection on the upstream slope of the dike.

c. Appurtenant Structures. The spillway is a concrete, ogee weir with a stilling basin at the toe. The spillway is in fair condition. The concrete facing of the weir is spalled and there are many irregular, horizontal cracks. Most vertical cracks are aligned with the metal posts used to support the wooden footbridge. There is one vertical crack located between support posts. The wooden footbridge spanning the spillway contains two boards which are rotting. The bottom of the metal support posts for the bridge are rusted. The downstream end of the right training wall is spalled. There is some erosion of both training walls below the high water mark. There is also a vertical crack in each training wall near the footbridge. At the time of inspection, water was flowing over the crest. The stilling basin is covered with stones and at the time of the inspection was submerged. The downstream channel is relatively clear of debris, but the sides of the channel contain a heavy growth of cattails and other vegetation. The bottom of the channel is a natural streambed containing loose stones.

The outlet conduit is a 24-inch diameter pipe. The inlet is not visible. A small vortex periodically appeared and disappeared over the upstream end of the outlet pipe on the first day of inspection. No vortex was observed on the second day. The concrete visible above the water line in the slide gate chamber is in fair condition. There is a slight amount of spalling, a few minor horizontal hairline cracks, and considerable staining of the concrete. Both slide gates were reportedly closed at the time of the inspection, although water was observed flowing through the chamber and outlet pipe. There are no operating mechanisms on the slide gates, and a wrench is used to turn the nonrising stems. The stem extensions and metal support frame are corroded. The two hinged, steel access covers are slightly rusted. Both doors are locked. Portions of the timber sheeting exposed next to the downstream concrete headwall are missing. The concrete headwall is slightly spalled. The outlet pipe was completely submerged. The pipe was encrusted and overgrown with algae, and the invert was covered with about 0.2 foot of sediment. The channel is a natural streambed that joins the spillway discharge channel just downstream of the embankment. The channel is relatively clear of debris.

d. Reservoir Area. Lake Mirimichi is divided by a causeway with a bridge opening 11.1 feet wide and 4.8 feet high on Mirimichi Street. North of the causeway the area is relatively undeveloped. South of the causeway, there is moderate residential development along the shoreline. The surrounding area is heavily wooded with low hills. Two unnamed brooks flow through nearby swamps into the west and north ends of Lake Mirimichi. A power line crosses the east end of the lake from the right embankment of the dam.

e. Downstream Channel. The discharge from the spillway flows into a natural streambed. The stream is surrounded by swamp which is thickly overgrown with trees and brush. After meandering through the swamp, the stream merges with

Wading River about 2,300 feet downstream of the dam close to Cedar Street. The river flows under a bridge, meanders through more swamp and under bridges at Interstate Highway 95. The discharge from the outlet pipe flows into a natural channel which merges with the stream below the spillway.

3.2 Evaluation. The above findings indicate that the dam is in fair condition but there are several deficiencies which require attention. It is evident that the dam is not adequately maintained. Recommended measures to improve these conditions are stated in Section 7.3.

SECTION 4

OPERATING PROCEDURES

4.1 Procedures. Under normal conditions, both gates in the slide gate chamber are closed. When the flow into Blake's Pond from Wading River is low, gate A on the outlet pipe is opened to provide additional water supply for the City of Attleboro. Gate B on the outlet bypass is inoperable. The outlet is usually opened in the dry months of July or August. The Massachusetts Department of Environmental Quality Engineering is notified whenever the outlet is operated by the City of Attleboro. Flashboards are not used on the spillway.

4.2 Maintenance of Dam. There is no systematic maintenance program at the dam. Seepage and erosion has been noted at various locations on the embankment in past inspections and during the present inspection. Riprap protection is inadequate and vegetation is growing on both slopes of the embankment. Also, the concrete on the spillway is cracked and spalled.

4.3 Maintenance of Operational Facilities. Only the downstream end of the outlet conduit and the upper 5 feet of the slide gate chamber were visible at the time of inspection. The valve stem extensions are corroded and the interior of the chamber is half filled with water. Also, gate B on the outlet bypass has not recently been used or checked.

4.4 Description of Any Warning System in Effect. There is no warning system in effect at the dam.

4.5 Evaluation. There is no regular program of inspection or maintenance or any warning system in effect at the dam. Lake Mirimichi Dam is in fair condition and has been placed in the "significant" hazard category because of the possible danger to life and property downstream. For this reason, it is important that procedures for operation, maintenance and emergencies be implemented as recommended in Section 7.3.

LAKE MIRIMICHI DAM

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General. Lake Mirimichi Dam is a 14-foot high, 620-foot long earthfill dam built prior to 1925. In 1926, a concrete spillway and outlet pipe were added to the existing structure. The lake is also impounded by a 7-foot high, 800-foot long dike which begins about 50 feet south of the main dam.

There are five dams located upstream on two unnamed tributaries draining into Lake Mirimichi. The lake serves to augment flow into Wading River during dry summer months. The river drains into reservoirs farther downstream which provide a water supply for the City of Attleboro.

The 11.57 square mile drainage area is generally sparsely developed, wooded and gently rolling. At the time of inspection, the lake was at El 158.7 and water was discharging over the spillway.

b. Design Data. Hydraulic or hydrologic computations are not available for the design of the spillway.

c. Experience Data. Operating records are not available for this dam. However, the Owner reported that there was minor overtopping of the dam during a storm in 1955. Records from the gaging station on Wading River indicate that a maximum recorded discharge of 541 cfs (28 cfs per square mile) occurred on March 19, 1968 The gaging station is located so far downstream from Lake Mirimichi Dam that the records are not considered applicable for the dam.

d. Visual Observations. Discharge from Lake Mirimichi is over the spillway located near the middle of the dam. At the toe of the weir is a flat-bottomed concrete stilling basin.

The spillway is in fair condition. The concrete on the weir of the spillway is cracked and spalled. The weir and stilling basin were clear of debris, although material could be caught on the permanent supports for the walkway over the weir. Stones have accumulated in the floor of the stilling basin. Also, trees are overhanging both sides of the spillway.

e. Test Flood Analysis. Lake Mirimichi Dam has been placed in the "small" size category and the "significant" hazard category. According to the Corps of Engineers' Guidelines, the range between the 100-year and the one-half PMF should be used to evaluate the capacity of the spillway. In the following analyses, one-half the PMF was used.

The PMF rate was determined to be 800 cfs per square mile. This calculation is based on the average slope of the drainage area of 1.3 percent, the pond-plus-swamp area to drainage area ratio of 13.5 percent, and the U.S. Army Corps of Engineers' guide curves for Maximum Probable Flood Peak Flow Rates (dated December 1977). Applying one-half the PMF to the 11.57 square miles of drainage area results in a calculated peak flood flow of 4,600 cfs as the inflow test flood. By adjusting the inflow test flood for surcharge storage, the maximum discharge rate was established as 4,000 cfs, with the surface of the lake at El 163.5.

Hydraulic analyses indicate that the spillway can discharge a total of 700 cfs at El 161.3, which is the average low point on the crest of the dike. The spillway can discharge only 17.5 percent of the test flood outflow before the dam is overtopped.

Flow over the crest of the dam and dike is predicted to be 2,380 cfs, and flow through the spillway would be 1,620 cfs. These calculations are based on neglecting overtopping at the swale area next to Cedar Street. The maximum head on the dike would be 2.2 feet and on the dam 2.5 feet in the area immediately adjacent to the spillway training walls. The

average head on the dam would be 0.8 foot and 1.3 feet on the swale at the south end of the lake. The depth of water over the dam at critical flow would be 1.29 feet with a velocity of 6.45 feet per second. The low level outlet can lower the pond by 1 foot in 38 hours starting with the lake surface at El 161.3.

f. Dam Failure Analysis. In the event of failure of the dam with the water surface at El 161.3, the initial outflow would be in the order of 4,800 cfs. This is based on a breach 250 feet wide and a hydraulic head of 9.3 feet. Failure of the dam would produce a flood wave 4 feet high down to Cedar Street, as estimated using the Corps of Engineers criteria. No significant reduction of this depth is expected downstream to Route I-95. A flow of 3,100 cfs is estimated to overtop Cedar Street. Lake Mirimichi is expected to drain in about 4.4 hours. The area downstream of the dam to Cedar Street is a wide, undeveloped, swampy flood plain. Up to four homes located north and south of Cedar Street adjacent to Wading River could be impacted by the calculated flood wave. The lightly developed residential area east of the river between Cedar Street and I-95 will not be impacted by the calculated flood wave due to the higher elevation of those houses.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The evaluation of the structural stability of Lake Mirimichi Dam is based on review of available drawings and the visual inspection conducted on December 5 and 6, 1978. As discussed in Section 3, Visual Inspection, the dam is in fair condition.

Based on observations as discussed in Section 3, it is recommended that a more detailed investigation be initiated to evaluate the stability of the dam and dike and the seepage at the downstream toe of the dam and dike.

b. Design and Construction Data. The information listed in Section 2, Engineering Data, represents the available design data. There are no other plans, specifications or computations available on the design and construction of this dam from the Owner, County or State offices.

Information does not appear to exist on the type, shear strength, and permeability of the soil and/or rock materials of the embankment. The available drawings only show design of the spillway and outlet structures. The locations of three "test wells" are shown on the drawings, but the logs are not available.

c. Operating Records. There is no evidence of instrumentation of any type in Lake Mirimichi Dam, and there is nothing to indicate that any instrumentation was ever installed in this dam. The performance of the spillway and dam under prior loading can only be inferred from physical evidence at the site.

d. Post-Construction Changes. There are no recorded changes after 1926.

e. Seismic Stability. The dam is located in Seismic Zone No. 2, and in accordance with Phase I "Recommended Guidelines" does not warrant seismic analysis at this time.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based upon a review of available drawings, the visual inspection of the site, and limited information on operation or maintenance, there are deficiencies which must be corrected to assure the continued performance of this dam. Generally, the dam is considered to be in fair condition. The principal areas of concern are: seepage just beyond the downstream toe of the dam and dike; erosion at several locations on the embankment; growth of bushes and trees on the dam and dike; lack of adequate riprap protection on the upstream face of the dam and dike; cracking and spalling of the concrete on the weir and training walls of the spillway; lack of adequate riprap near the downstream toe of the embankment in the vicinity of the outlet pipe; corrosion of the metal frame and gate stem extensions in the slide gate chamber; and an accumulation of trash and debris along the downstream toe of the left embankment about 70 feet south of the cabin.

Hydraulic analyses indicate that the existing spillway can discharge a flow of 700 cfs at reservoir El 161.3, which is the average low elevation on the crest of the dike. The spillway can discharge only 17.5 percent of the test flood before the dike is overtopped. An outflow test flood of 4,000 cfs (one-half the PMF) will overtop the dam by an average of 0.8 foot, except 2.5 feet adjacent to the spillway will overtop the dike by about 2.2 feet and overtop the swale near Cedar Street by 1.3 feet. It was verbally reported that in 1955 the dam was slightly overtopped.

b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing

design and construction data, but is based primarily on a review of available drawings, the visual inspection, past performance history and engineering judgment.

c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

d. Need for Additional Investigation. Additional investigations to further assess the adequacy of the dam are outlined below in Section 7.2 Recommendations.

7.2 Recommendations. In view of the concerns over the continued performance of the dam and spillway, it is recommended that the Owner employ a qualified consultant to:

a. evaluate the stability of the dam and dike,

b. evaluate the seepage at the toe of the dam and dike,

c. conduct a more detailed hydrologic and hydraulic investigation to evaluate increasing existing spillway capacity, or adding an emergency spillway or raising the dam, dike and swale,

d. pump water out of the slide gate chamber, after sealing the inlet pipe, to inspect and evaluate the submerged portion of the chamber and the condition of the two slide gates, evaluate alternatives for plugging or sealing the apparent bypass.

e. design riprap for the upstream face of the dam, dike and downstream end of the outlet pipe.

Recommendations on repairs and maintenance procedures are outlined below under Section 7.3, Remedial Measures.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The dam is not adequately maintained. It is recommended that the Owner accomplish the following:

(1) Selectively clear trees, brush and debris and selectively clear roots from the dam and dike embankments. This should include removal of trash and debris in the area of the downstream toe of the dam about 70 feet south of the cabin. All stumps and roots removed should be back-filled with select material.

(2) Fill in eroded areas on the downstream face of the dam.

(3) Repair spalled and cracked concrete on the crest and training walls of the spillway.

(4) Add riprap on the upstream face of the dam and dike and around the downstream headwall of the outlet. This riprap should be designed by a consultant as discussed in Section 7.2.e.

(5) Maintain the slide gates in working condition.

(6) Institute a definite plan for surveillance and a warning system during periods of unusually heavy rains and/or runoff.

(7) Implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances and be supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in compliance with all applicable State regulations. The maintenance program should include maintenance of the walkway spanning the spillway. Any debris caught by the walkway supports should be promptly removed to prevent clogging of the spillway.

(8) Technical inspections of this dam should be conducted on an annual basis.

7.4 Alternatives. There are no recommended alternatives.

LAKE MIRIMICHI DAM

APPENDIX A

PERIODIC INSPECTION CHECKLIST

LAKE MIRIMICHI DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

TIME 2:00 P.M.& 8 A.M.,respectively

WEATHER Clear, temp. about 40°F

W.S. ELEV *158.7 U.S.152.7 DN.S.

*Benchmark monument elevation 161.07 on top of left spillway training wall.

PARTY:

1. Michael Larson
2. George Komisarek
3. Susan Pierce
4. Henry Lord
5. William Checchi
6. David Cole
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam	Larson	
2.	Spillway	Branagan	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

PROJECT FEATURE Dam Embankment NAME M. Larson

DISCIPLINE Geotechnical NAME G. Komisarek

Note: U/S = Upstream; D/S = Downstream

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	Varies from 161.0 to 164.7
Current Pool Elevation	158.7
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	N/A (not applicable).Crest is covered with grass and trees.
Movement or Settlement of Crest	None visible
Lateral Movement	None visible
Vertical Alignment	Level
Horizontal Alignment	Right embankment is concave D/S. Left embankment has right angle turn.
Condition at Abutment and at Concrete Structures	Rt.abutment-fair cond., earth,trees and one house, some trash and debris. Lt.abutment-good cond.,earth,trees & asphalt road.
Indications of Movement of Structural Items on Slopes	None visible.Lt.embankment has large house, Rt.embankment has 3 power poles.
Trespassing on Slopes	Footpath along entire crest,wooden foot bridge across spillway,transverse paths along spillway training walls.
Sloughing or Erosion of Slopes or Abutments	Erosion on transverse footpaths along left spillway training wall &just south of rt.tr. wall.
Rock Slope Protection - Riprap Failures	A few scattered pieces along U/S slope,some near U/S ends of both spillway tr. walls & some @ D/S end of outlet pipe.
Unusual Movement or Cracking at or near Toes	None visible
Unusual Embankment or Downstream Seepage	Large pool of water between outlet pipe & spillway at D/S toe; seepage at D/S toe on lt.embankment, one just lt.of spillway & second area south of cabin.
Piping or Boils	None visible
Foundation Drainage Features	None visible
Toe Drains	None visible
Instrumentation System	None visible

PERIODIC INSPECTION CHECK LIST

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

PROJECT FEATURE Dike Embankment NAME M. Larson

DISCIPLINE Geotechnical NAME G. Komisarek

AREA EVALUATED	CONDITION
DIKE EMBANKMENT Crest Elevation	Asphalt pavement on crest serves as access road to houses along shoreline. Varies from 161.0 to 163.5
Current Pool Elevation	158.7
Maximum Impoundment to Date	Unknown
Surface Cracks	Minor cracking of asphalt pavement along D/S edge
Pavement Condition	Good
Movement or Settlement of Crest	Just minor differential dipping of pavement surface.
Lateral Movement	None visible
Vertical Alignment	Level
Horizontal Alignment	Series of several straight lines & gentle curves.
Condition at Abutment and at Concrete Structures	Rt.abutment-good,trees & grass cover.Lt. abutment-good,trees & grass cover. One cabin near abutment on lt.embankment-good.
Indications of Movement of Structural Items on Slopes	None visible
Trespassing on Slopes	Asphalt pavement along full length of crest. Oper access to shoreline,houses & driveways.
Sloughing or Erosion of Slopes or Abutments	None visible
Rock Slope Protection - Riprap Failures	Very minor amounts of riprap, erratic distribution.
Unusual Movement or Cracking at or near Toes	None visible
Unusual Embankment or Downstream Seepage	Water at toe of D/S slope for most of length of dike,an apparent ditch with water conveyed by one culvert under a knoll near center of dike.
Piping or Boils	None visible
Foundation Drainage Features	None visible
Toe Drains	None visible
Instrumentation System	None visible

PERIODIC INSPECTION CHECK LIST

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

PROJECT FEATURE Outlet Works NAME M. Larson

DISCIPLINE Geotechnical NAME G. Komisarek

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Not visible, submerged, 24inch diameter pipe. About 10 ft. from dam, a whirlpool sporadically appeared and disappeared on surface.
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECK LIST

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

PROJECT FEATURE Outlet Works NAME M. Larson

DISCIPLINE Geotechnical NAME G. Komisarek

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT General Condition of Concrete	Concrete box on crest of dam, 5 by 8.1 ft. in plan, flush with crest of dam. Flat cover has two separate hinged metal plates with locks. Concrete is in fair condition *
Rust or Staining on Concrete	Considerable rust on interior, minor efflorescence.
Spalling	Moderate, on interior. Minor horizontal hairline cracks.
Erosion or Cavitation	None visible
Cracking	None visible
Alignment of Monoliths	Good
Alignment of Joints	None visible
Numbering of Monoliths	N/A

No trash rack, although two sets of slots at U/S end of concrete box. Two valve stems extend to steel frame on inside. Stems and frame moderately corroded, no valve operating mechanisms.

*Limited visibility, partly submerged.

PERIODIC INSPECTION CHECK LIST

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

PROJECT FEATURE Outlet Works NAME M. Larson

DISCIPLINE Geotechnical NAME G. Komisarek

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	Concrete headwall at D/S toe protrudes beyond embankment, 24 inch diameter cast iron pipe discharges from headwall.Pipe*
General Condition of Concrete	Fair
Rust or Staining	Some
Spalling	Slight spalling on sides.
Erosion or Cavitation	None visible
Visible Reinforcing	None
Any Seepage or Efflorescence	None
Condition at Joints	N/A
Drain Holes	N/A
Channel	Streambed is part of an inundated swamp.
Loose Rock or Trees Overhanging Channel	Mostly bushes with some small trees along ill defined channel.
Condition of Discharge Channel	Submerged, limited visibility. Fair, with some dead trees.

*is encrusted, overgrown with algae and filled with about 0.2 foot of sediment at invert.

PERIODIC INSPECTION CHECK LIST

PROJECT Lake Mirimichi DATE December 5 & 6, 1978

PROJECT FEATURE Spillway NAME M. Larson

DISCIPLINE Hydraulic NAME L. Branagan

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	Wooden walkway bridge over crest.
a. Approach Channel	
General Condition	Good, clear, no visible obstructions.
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Some small trees & bushes
Floor of Approach Channel	Not visible
b. Weir and Training Walls	
General Condition of Concrete	Training walls - fair Ogee weir-fair,many horizontal & vert.*
Rust or Staining	Staining on weir face & below high water mark on training walls.
Spalling	Training walls-at D/S end of walls & below high water mark;D/S tip of left**
Any Visible Reinforcing	None, except form tie rods
Any Seepage or Efflorescence	Very minor efflorescence
Drain Holes	None
c. Discharge Channel	
General Condition	Good, clear, no visible obstructions.
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	A few bushes & small trees
Floor of Channel	Clear, flat, cobble and stone bottom.
Other Obstructions	Relatively clear, few clumps of brush.

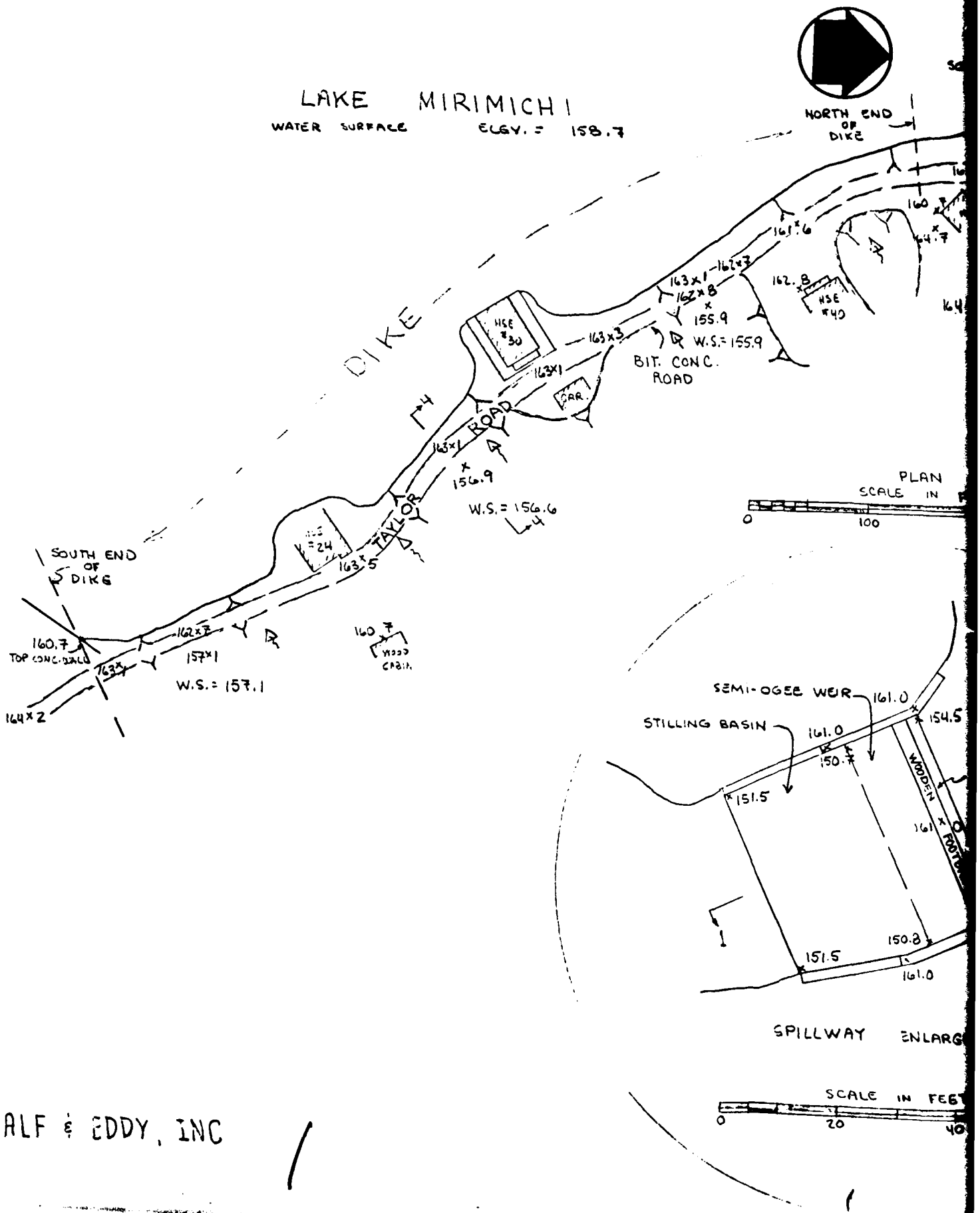
*cracks. Horizontal cracks are irregular. Vertical cracks at walkway support struts, including one vertical crack between struts.

**wall is missing. Weir-spalled but limited visibility.

APPENDIX B

PLAN OF DAM

		Page
Figure B-1	Plan of Dam and Dike	B-1
Figure B-2	Sections through Dam and Dike	B-2
Figure B-3	Dam at Lake Mirimichi, Plan and Sections of Proposed Concrete Spillway	B-3
Figure B-4	Dam at Lake Mirimichi, Plan and Sections of Proposed Pipe Outlet Works	B-4



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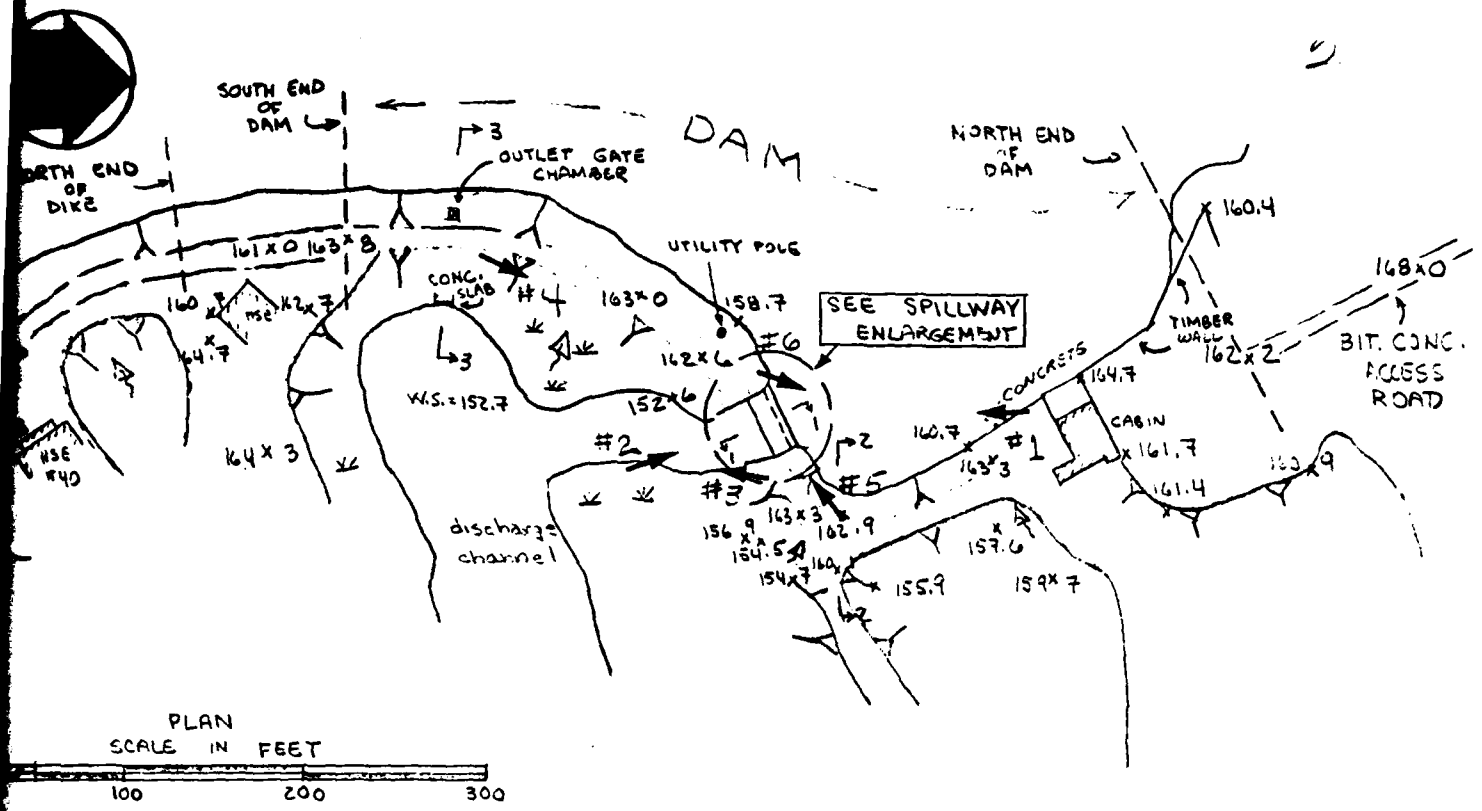
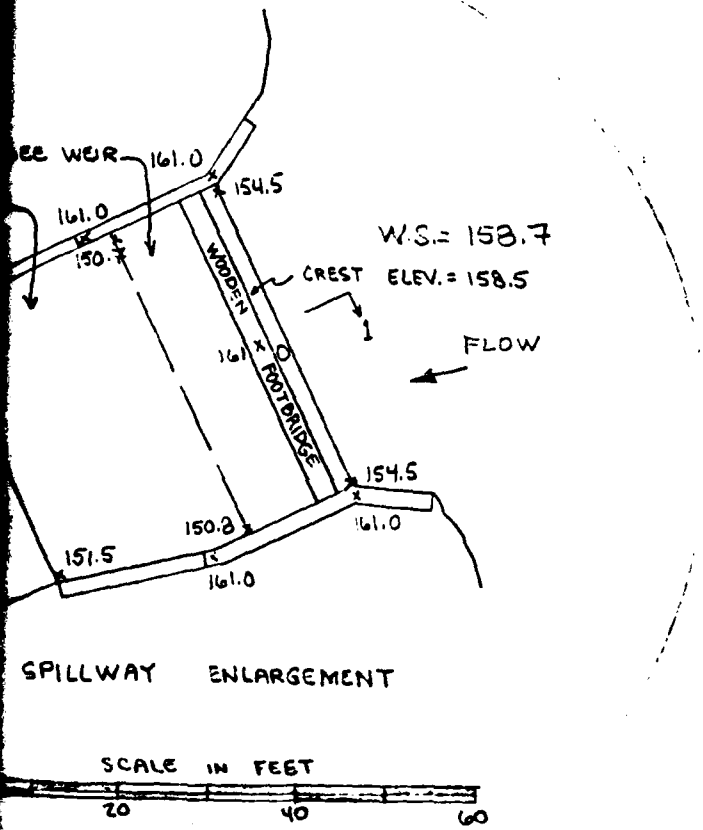


PLAN
SCALE IN FEET
100 200 300



SPILLWAY ENLARGEMENT
SCALE IN FEET
20 40 60

NOTES:

1. ELEVATIONS SHOWN ARE REFERENCED TO CITY BENCHMARK ELEV. = 161.07 ON LEFT SPILLWAY TRAINING WALL
2. INFORMATION SHOWN BASED ON FIELD SURVEY OF DECEMBER 5, 6, 1978
3. ⸸ DENOTES MARSH
4. ⛬ DENOTES SEEPAGE
5. #2 INDICATES LOCATION AND DIRECTION OF VIEW FOR PHOTOGRAPHS
6. SEE FIGURE B-2 FOR SECTIONS THROUGH DAM AND DIKE

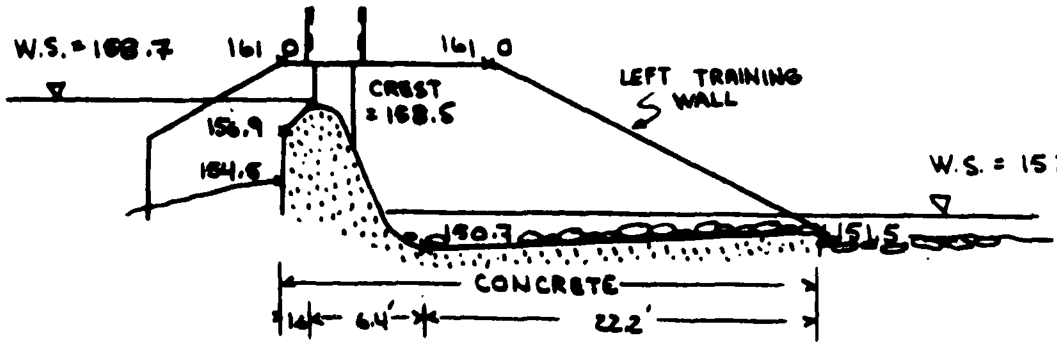
METCALF & EDDY, INC. ENGINEERS BOSTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

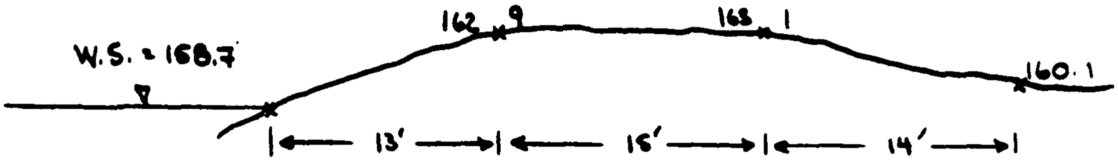
LAKE MIRIMICHI DAM

FIGURE B-1 PLAN OF DAM AND DIKE

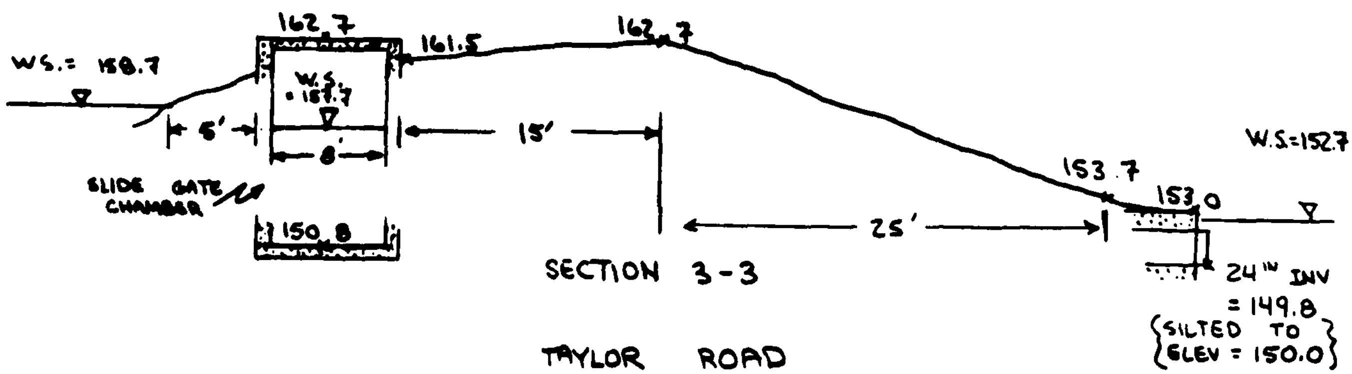
TRIBUTARY TAUNTON RIVER	MASSACHUSETTS
SCALE: AS SHOWN	DATE: MARCH, 1979



SECTION 1-1
SPILLWAY

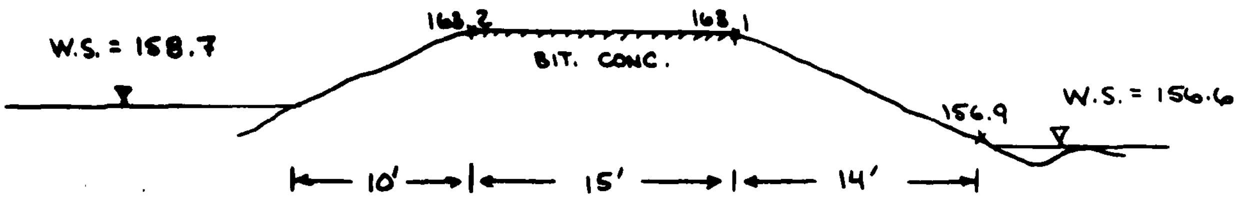


SECTION 2-2

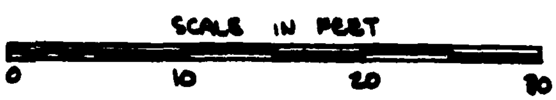


SECTION 3-3

TAYLOR ROAD



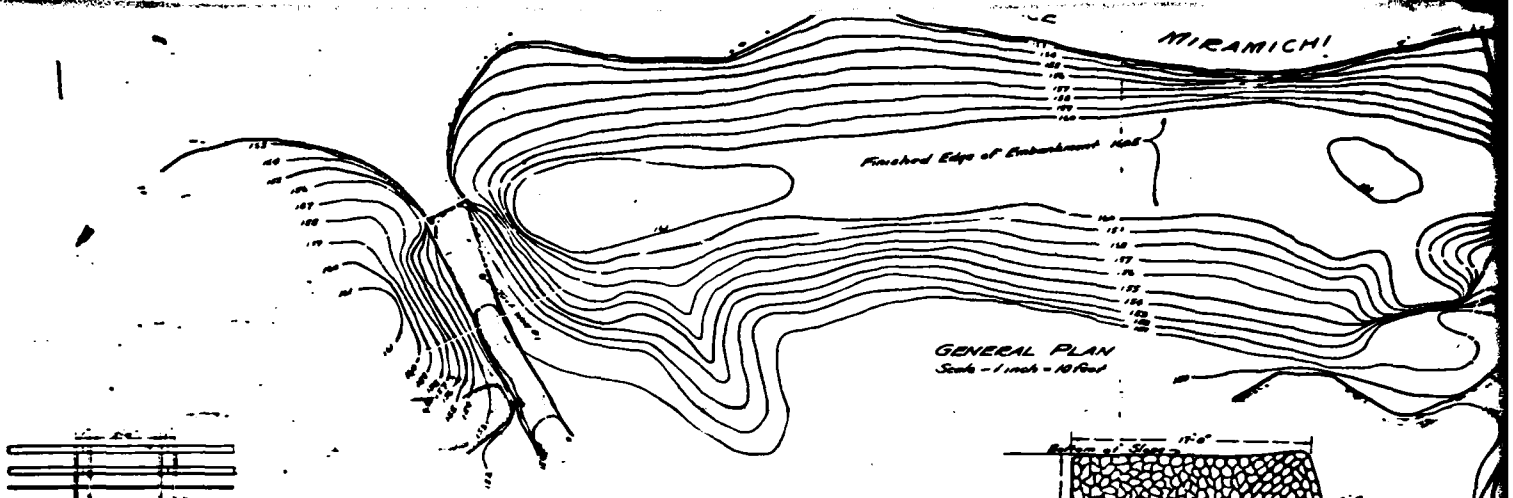
SECTION 4-4

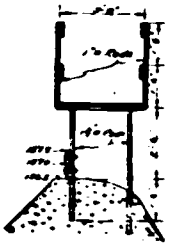


NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LAKE MIRIMICHI DAM

METCALF & EDDY, INC.





CITY OF ATTLEBORO

ADDITIONAL WATER SUPPLY FROM WADING RIVER AND TRIBUTARIES

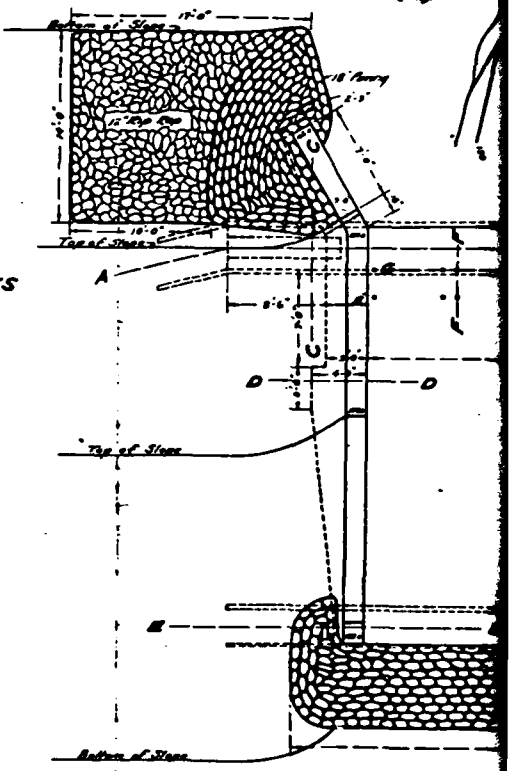
CONSTRUCTION OF DAM AT LAKE MIRAMICHI

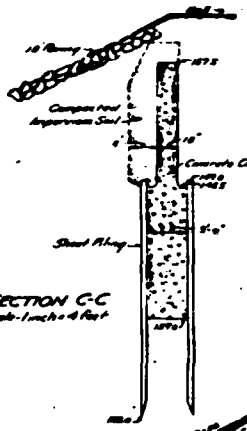
PLAN AND SECTIONS OF PROPOSED CONCRETE SPILLWAY

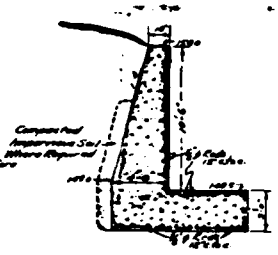
FOXBORO MASS.

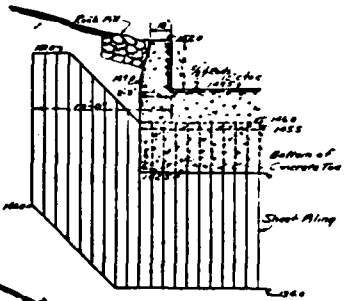
J. J. VanValkenburgh - C.E. — Scales as noted

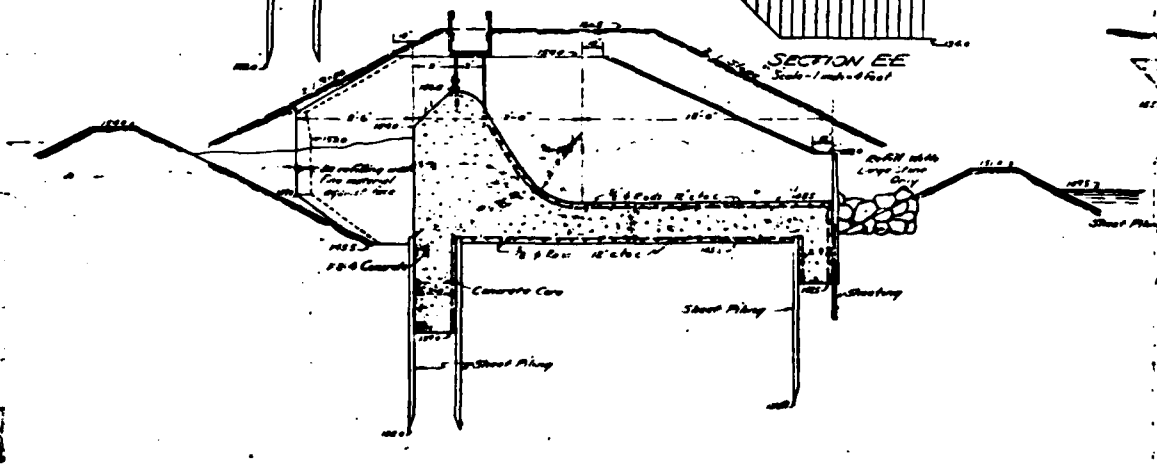
Framingham Mass. — September 1925

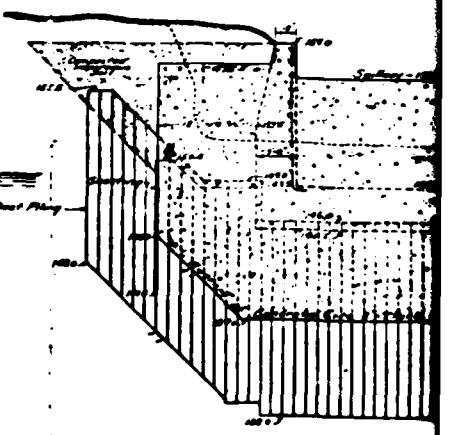


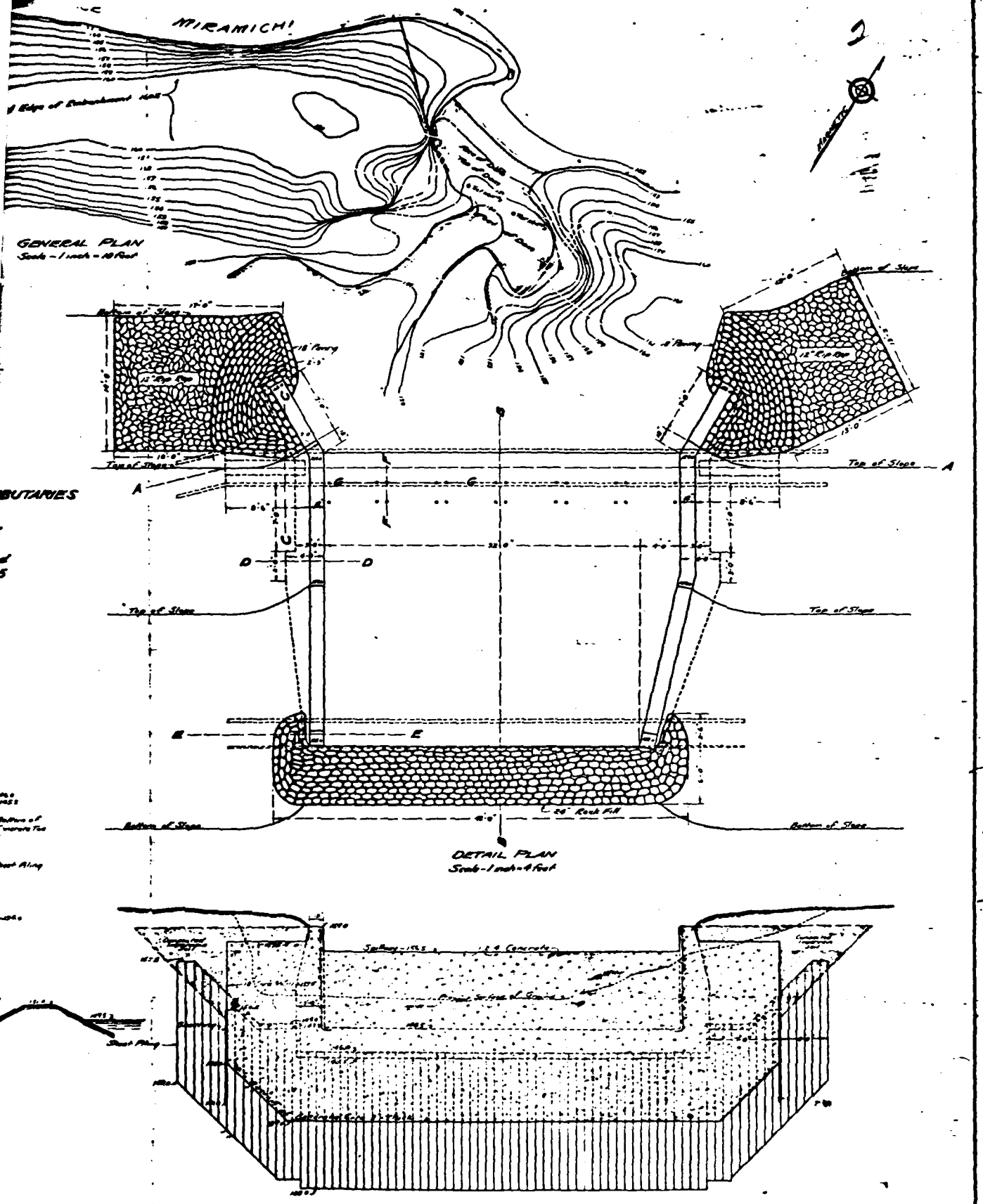






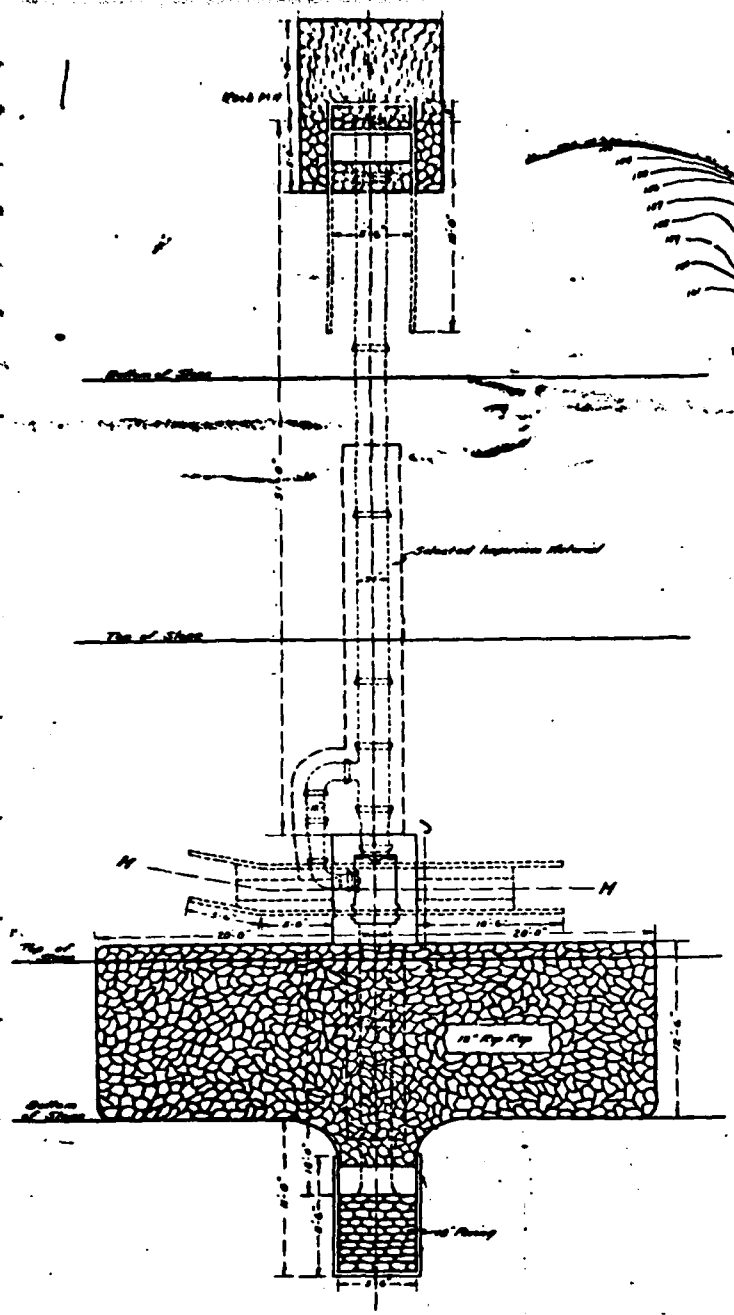






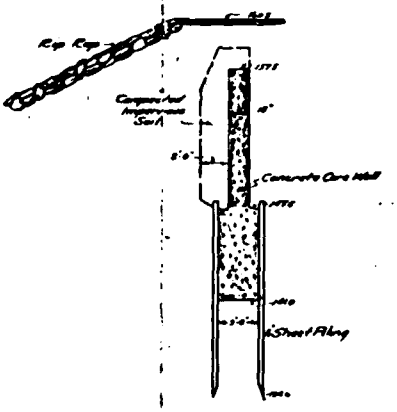
NOTE:
PLAN REDUCED FOR
THIS REPORT

LAKE MIRIMICHI DAM FIGURE B-3

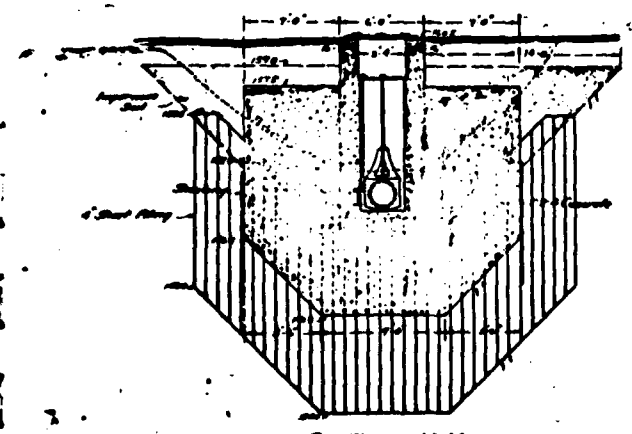


GENERAL PLAN
Scale - 1 inch = 40 feet

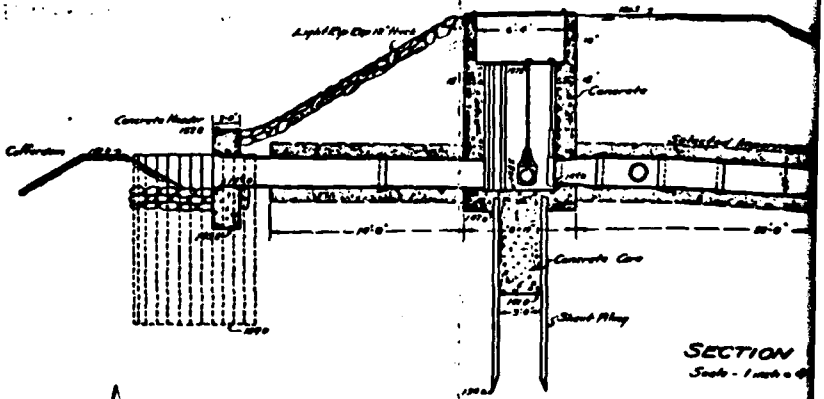
DETAIL PLAN
Scale - 1 inch = 40 feet



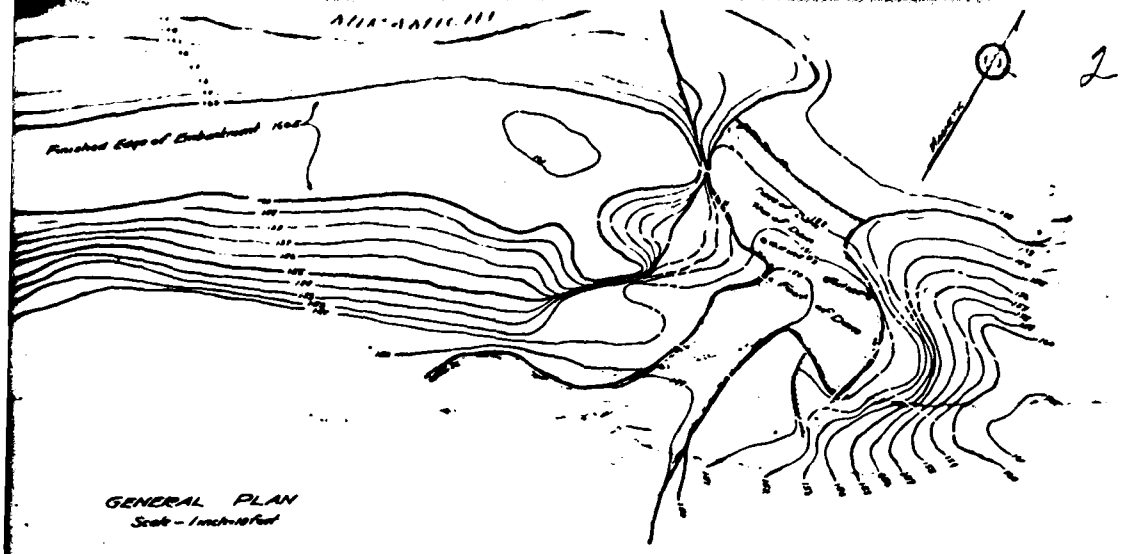
SECTION J-J
Scale - 1 inch = 4 feet



SECTION H-H
Scale - 1 inch = 4 feet



SECTION
Scale - 1 inch = 4



CITY OF ATTLEBORO

ADDITIONAL WATER SUPPLY FROM WADING RIVER AND TRIBUTARIES

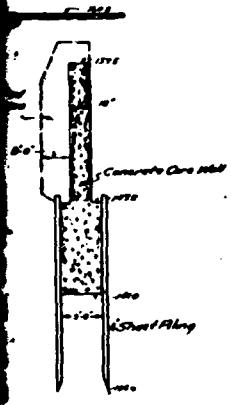
CONSTRUCTION OF DAM AT LAKE MIRAMICHI

PLAN AND SECTIONS OF PROPOSED PIPE OUTLET WORKS

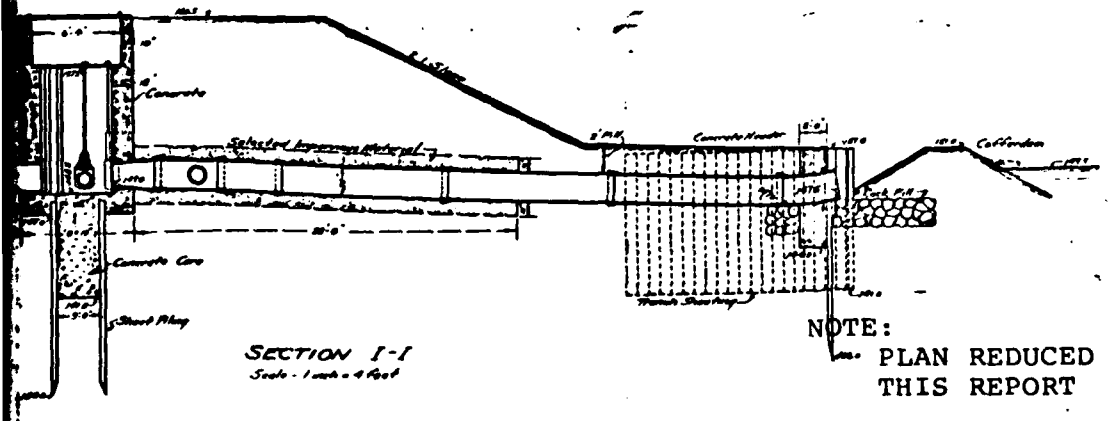
FOXBORO MASS.

J. J. VanValkenburgh - C.E.
Framingham Mass.

Scales as noted
September 1925.



SECTION J-J
Scale - 1 inch = 4 feet



SECTION I-I
Scale - 1 inch = 4 feet

NOTE:
PLAN REDUCED FOR THIS REPORT

LAKE MIRIMICHI DAM

FIGURE B-4

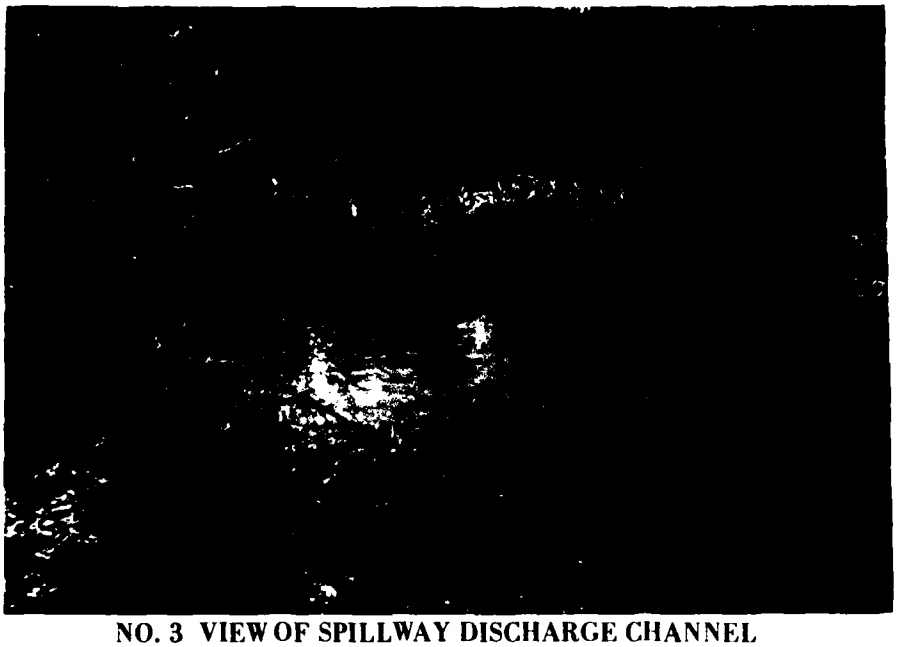
APPENDIX C

PHOTOGRAPHS

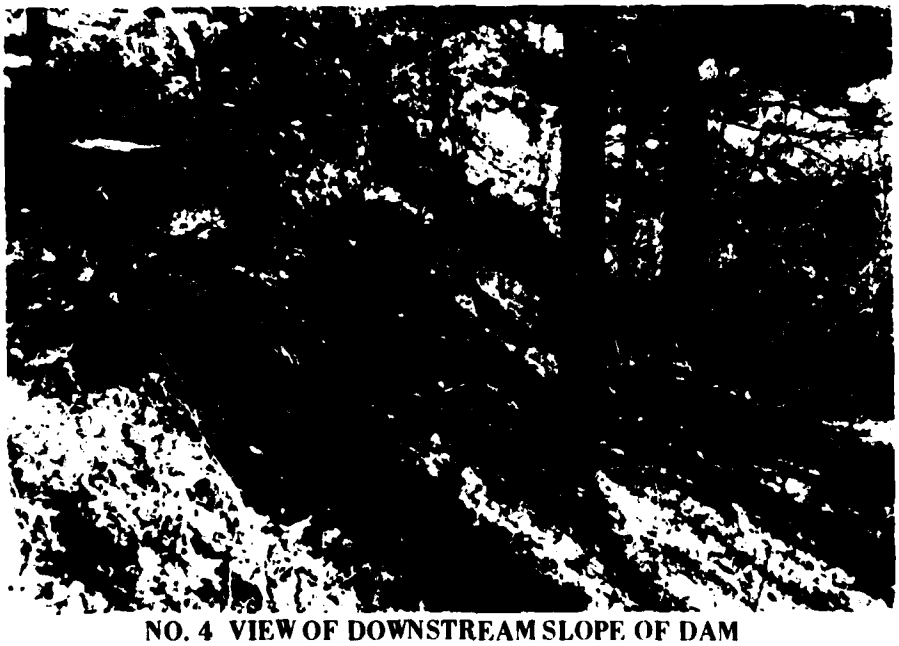
LAKE MIRIMICHI DAM

NO. 1 VIEW OF SPILLWAY AND EMBANKMENT

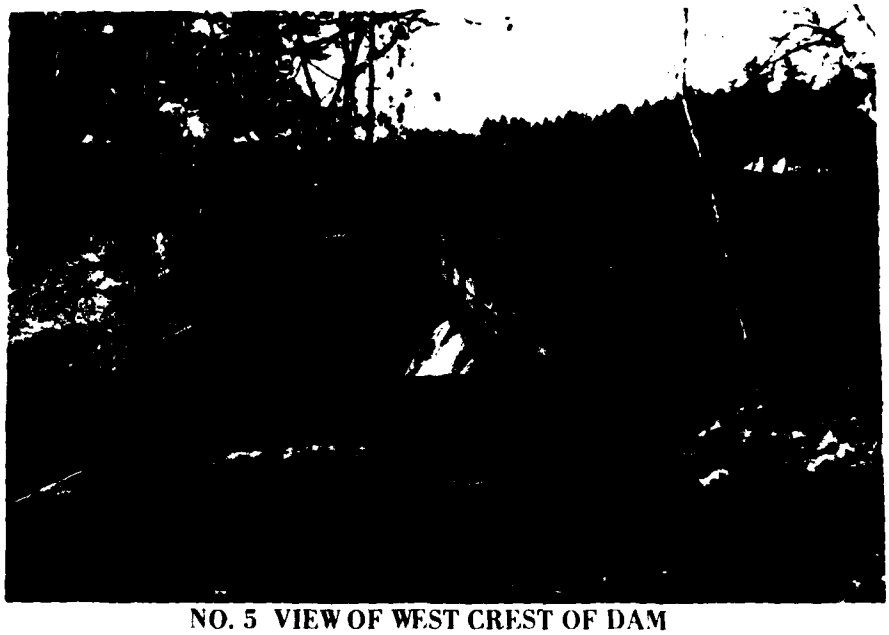
NO. 2 VIEW OF SPILLWAY



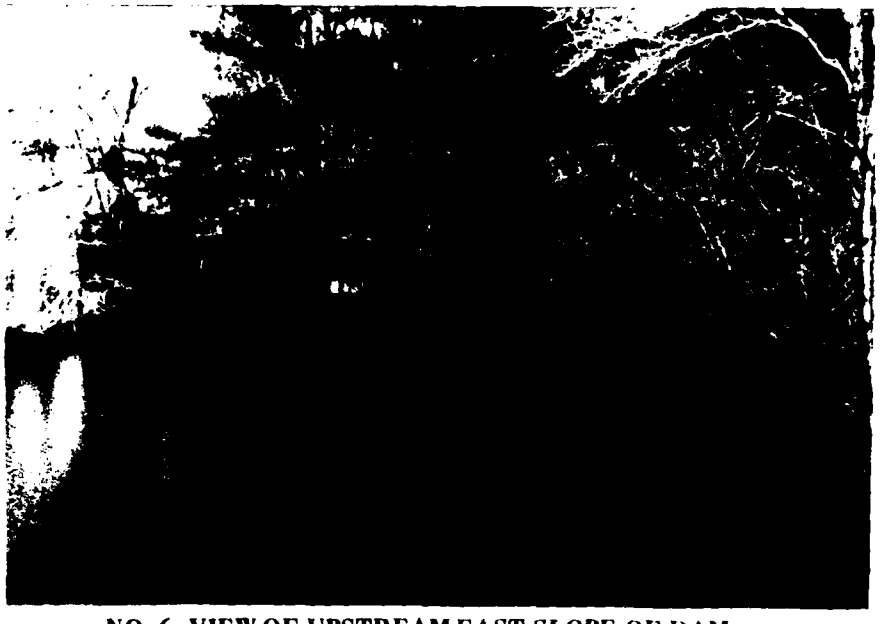
NO. 3 VIEW OF SPILLWAY DISCHARGE CHANNEL



NO. 4 VIEW OF DOWNSTREAM SLOPE OF DAM



NO. 5 VIEW OF WEST CREST OF DAM



NO. 6 VIEW OF UPSTREAM EAST SLOPE OF DAM

NO. 7 VIEW OF OUTLET CONDUIT

NO. 8 VIEW OF UPSTREAM SLOPE OF DIKE

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

	Page
Figure D-1 Drainage Area Map - Lake Mirimichi	D-1
Computations	D-2

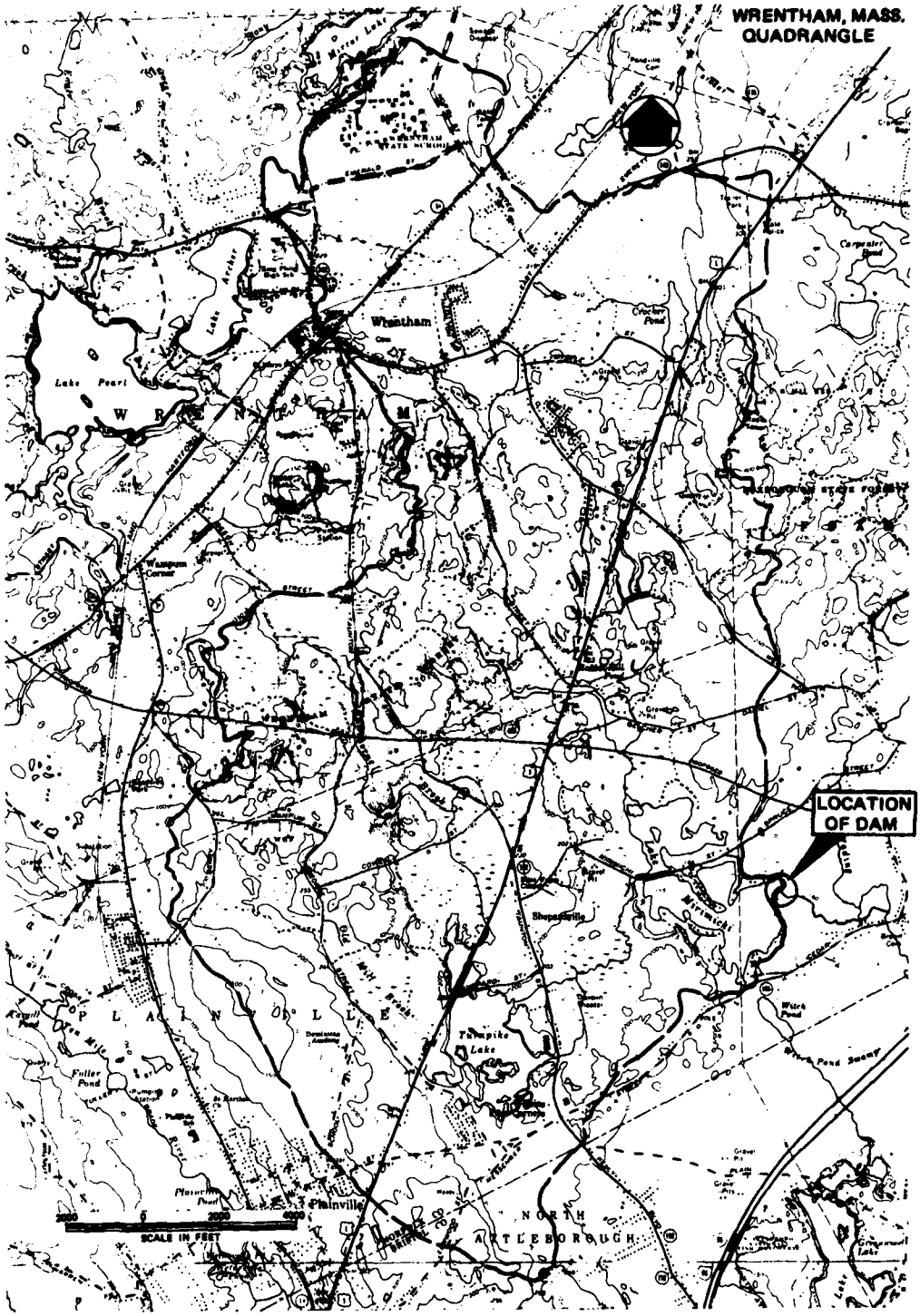


FIG. D-1 DRAINAGE AREA MAP – LAKE MIRIMICHI

Project Nat. Review of Non Fed. Dams Acct. No. 6191 Page 1 of 4
Subject Norfolk County, Mass. Compld. By LEE Date 12/21/78
Detail LAKE MIRIMICHI DAM Ck'd. By MBG Date 1/17/79

(I) Test Flood, Storage & Storage Functions

1- Total Drainage Area - 11.57 mi²

2- Pond(s) Area: .240+.211+.007+.013+.061+.029 = 0.561 mi²
Swamp(s) Area: .185+.168+.131+.157+.055+.078+.089+.177 = 1.000 "
Total Area Pond(s) & Swamp(s): 1.561 "

% Ponds & Swamps = $\frac{1.561}{11.57}$ = 13.5%

3- $\frac{390-159}{12800}$ = .0180
$\frac{290-159}{24000}$ = .00488
} Say Ave Slope = 1.3%

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be slightly above "Flat & Coastal", and taken at 800 c.f.s./mi²
Size Class: Small ; Hazard Pot.: Signif. ; Spill. Des. Flood: 100 yr to ½ PMF
Use: Test Flood = ½ PME

5- **Test Flood Inflow = ½(800)11.57 = 4600 c.f.s.**

6- Pond Storage
The pond area is 0.24 sq. mi. at elev. 159. Based on a const. area, storage increases at 154 ac. feet per foot of depth increase. At pond elev. 161, 385 ac. ft. are stored above the spillway crest level.

7- Spillway crest elev. is 158.5

8- Storage Functions are based on $Q_{out} = Q_{in}\left[1 - \frac{S_{out}}{R}\right]$
S_{out} = Storage Vol. in Reservoir related to final Q_{out} in terms of inches of rain over the drainage area.

S(in Inches) = $12\,D\left(\frac{0.24}{11.57}\right) = 0.25\,D$; R = 6hr rain of storm
D = Storage depth in feet above spillway crest in reservoir

9- Storage Functions: (Test Flood & ½ PMF - if needed)

F_{TF}	$= 4600 - 487\,S = 4600 - 121\,D$
$F_{\frac{1}{2}PMF}$	$= F_{TF}$ [illegible] $S =$ [illegible] D

METCALF & EDDY, ENGINEERS

(II) Discharge Ratings

A - Spillway

Semi Ogee Crest ; $L = 36.5'$; Use : $Q_s = 4(36.5) H_s^{1.5} = 146 H_s^{1.5}$
Crest Elev. 158.5 ; Flashboards not used.

Pond Elev.	159	160	161	161.3	162.7	163.0	164.0	165.0
H_s	0.5	1.5	2.5	2.8	4.2	4.5	5.5	6.5
Q_s	50	270	580	680	1260	1390	1880	2420

B - Crest Flow

Use $q_c = 2.55(H_c)^{1.5}$ [Ref. : V.T. Chow, "Open Chan Flow" pg 52]

① 200' @ el. 161.3 ; ② 270' @ el. 162.7 , ③ 380 @ el. 163 ; ④ 400' @ 163.2, ⑤ 60' @ el 163.6

Pond Elev.	162.7	163.0	164.0	165.0
Q_1	840	1130	2260	3630
Q_2	—	110	1020	2400
Q_3	—	—	970	2740
Q_4	—	—	730	2460
Q_5	—	—	40	250
ΣQ	840	1240	5,020	11,480

C - Low Level Outlet

Losses; Inlet + Outlet = $1.5 h_v$, Value = $0.8 h_v$, Frict. = $0.5 h_v$ $(h_v = V^2/2g)$
$H_L = (161.3 - 150.8) = 10.5' = 2.8\, V^2/2g$; $V_L = 15.5$ fps ± ; $Q_L = \pm 49$ c.f.s.

Time to Lower Level 1' = $\frac{(153.7 ac)\, 43560}{49\,(3600)} = \underline{\pm 38 \text{ hours}}$

(III) Crest Flow

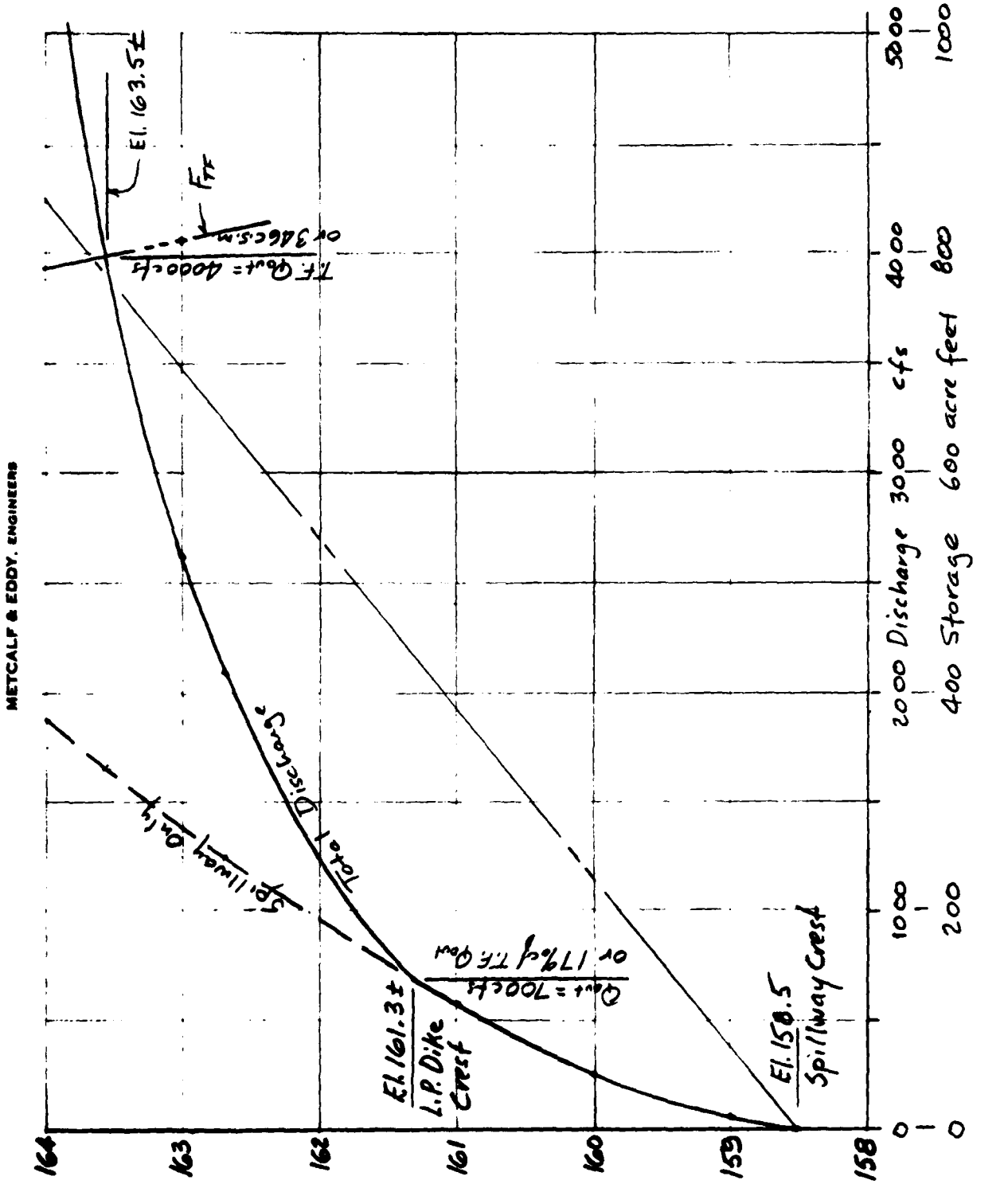
Under the test flood discharge, max. crest flow is :

$$q = 2.55(163.5 - 161.3)^{1.5} = 8.32 \text{ cfs}$$

As critical flow: $y_c = 1.29'$ & $V_c = 6.45$ fps.

Project Nat. Review of Non Fed. Dams Acct. No. 6191 Page 3 of 4
Subject Norfolk County Area Comptd. By LRB Date 12/28/78
Detail MIRIMICHI POND DAM Ck'd. By MBG Date 1/17/79

(IV) Discharge, Storage & Storage Function vs Pond Level



METCALF & EDDY, ENGINEERS

(V) Failure of Dam

Peak Failure Flow:

Pond Elevation - 161.3 (L.P. Crest)
Toe Elevation — 152 ±
Y_o = 9.3

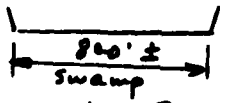
Dam Length Subject to Breaching = 250 ft
$W_o = 40\%(250') = 100'$

$$Q_P = 1.68\, W_o (Y_o)^{1.5} = 1.68(100)(9.3)^{1.5} = 4800 \text{ cfs.}$$

Storage Volume Released:

Storage Above Spillway	2.0'(153.7) =	430 ac. ft.
Storage Below Spillway	$\frac{1}{3}$(8.7)153.7) =	450 " "
S = Total Storage =		880 " "

Channel Hydraulics:



$S = \frac{10}{6500} = .00154$, $n = 1.0$, $V = 0.584\, R^{2/3}$
$R \simeq y$, $A = 800y$

y	A	V	Q
2	1600	.93	1480
3	2400	1.22	2910
4	3200	1.47	4710
5	4000	1.71	6830
6	4800	1.93	9260

Below dam is about 80 acres of swamp storage area, above Cedar Street.
Failure flow is about 4' deep at a full channel velocity of 1.5 fps.
Storage above Cedar St = 4'(80) = 320 ac. ft.
Flow over Cedar St $\simeq 4800\left(1 - \frac{320}{880}\right) = 3100$ cfs.

Between Cedar St. and Rte I95 is another 76 acres of swamp. The total dam storage would produce an average depth of 5.6 ft on the 156 acres of swamps. Discharge from the swamps would be controlled by the Wading River culvert under Rte I95. One or two houses on Cedar St. might be affected.

Time to Drain:

$$\frac{43560\ (880)}{3600(\frac{1}{2})(4800)} = 4.4 \text{ Hours. or } 266 \text{ Minutes}$$

APPENDIX E

INFORMATION AS CONTAINED
IN THE
NATIONAL INVENTORY OF
DAMS

LAKE MIRIMICHI DAM

INVENTORY OF DAMS IN THE UNITED STATES

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY | MO | YR
MA	1[illegible]	[illegible]	MA	021	10			LAKE SIRINICHI DAM	4201.5	7111.1	26APR74

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	06	TRADING RIVER	MANSFIELD	2	12447

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(27) NORMAL (ACRE-FT.)
EARTH	1925	S	14	14	850	460

DIST OWN FED R PHV/FED SCS A VER
FED N N N

(28) REMARKS

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) TYPE	(32) WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
	620		56	700	5000											

(38) OWNER	(39) ENGINEERING BY	(40) CONSTRUCTION BY
CITY OF ATTLEBORO	J.J. VANVALKENBURGH	

(41) REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
[illegible]	NONE	NONE	NONE

(42) INSPECTION BY	(43) INSPECTION DATE DAY | MO | YR	(44) AUTHORITY FOR INSPECTION
METCALF AND EDDY INC.	05DEC73	PUBLIC LAW 92-367

(45) REMARKS